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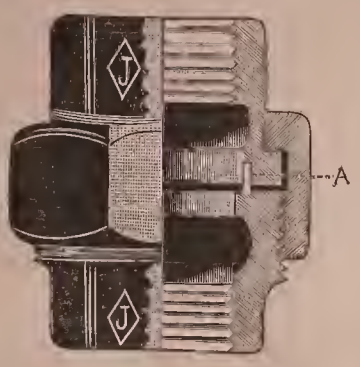

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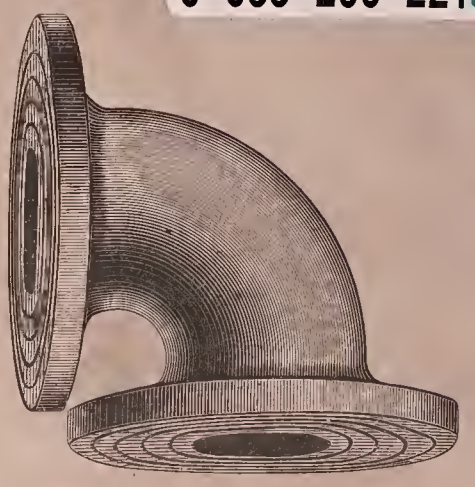

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KINL

EXPOSURE OF WALL OR GLASS SURFACE

CHART №1

LOOSE WINDOW
ORDINARY WINDOW
TIGHT GLASS
½ BRICK WALL
1 BRICK WALL
1½ BRICK WALL
2 " "
2½ " "
3 " "
DOOR

S. OR E. EXPOSURE, BLDG. NOT ISOLATED
N. OR W. OR E. EXPOSURE, BLDG. ISOLATED
S. OR E. EXPOSURE, BLDG. ISOLATED
N. OR W. OR E. EXPOSURE, BLDG. NOT ISOLATED

0
50
100
150
200
250
300

OUTSIDE TEMPERATURE

SQUARE FEET OF WALL OR GLASS SURFACE

20 DEGREES BELOW ZERO
10 " " "
0 " " "
10 " ABOVE " "
20 " " "

MANNER OF HEATING

DIRECT RADIATION HEATING CONTINUOUS
DIRECT RADIATION HEATING NOT CONTINUOUS
INDIRECT RADIATION HEATING CONTINUOUS
INDIRECT RADIATION HEATING NOT CONTINUOUS

FOR DIRECT-INDIRECT RADIATION USE LINE MARKED "DIRECT RADIATION, HEATING NOT CONTINUOUS"

SQUARE FEET OF HEATING SURFACE

0
50
100
150
200

2-18230

INTRODUCTION.

The author has long been in the habit of using charts to aid him in work of other kinds, and when he succeeded in devising these charts he felt that they would be of value to others as well as to himself. It is supposed that those who use the charts will have some knowledge of steam heating and that the charts will be used only as a means of shortening and reducing the work necessary to properly design and proportion the parts of a low pressure steam heating system for dwellings and other small buildings. While the author hopes that the charts will be of some value to engineers, they are published more especially for the use of architects and contractors.

Care has been taken to make the charts as clear and as easily understood and, above all, as accurate as possible. They have been based upon theoretical considerations modified by what is considered to be good practice in this country.

CHART NO. 1.

This chart is for determining the number of square feet of heating surface of a low pressure steam heating system, pressure not to exceed 5 pounds per square inch by the gauge, necessary to supply the heat lost through the various kinds of wall surfaces of rooms. The chart is divided into four parts. The lines in the lower left-hand part indicate different temperatures of the outside air, from 20 degrees below zero to 20 degrees above zero; the lines in the upper left-hand part indicate various kinds of wall surfaces; the lines in the upper right-hand part indicate the direction in which the wall or window faces, its exposure; the lines in the lower right-hand part indicate the manner of heating, whether by direct radiation or indirect radiation.

On the lower part of the left-hand border is a scale for the square feet of cooling wall or glass surface; and on the lower part of the right-hand border is a scale for the number of square feet of heating surface, whether direct or indirect.

To use the chart, find the point on the left-hand scale corresponding to the number of square feet of cooling surface and trace from this point towards the right, along an imaginary horizontal line, to the line indicating the temperature of the outside air; then trace upward to the line, in the upper left-hand part of the chart, indicating the kind of cooling surface; then trace towards the right to the line in the upper right-hand part of the chart, indicating the exposure of the cooling surface; then trace downward to the line, in the lower right-hand part of the chart, indicating the manner of heating; then trace towards the right to the scale of square feet of heating surface, and find on it the number of square feet of heating surface necessary to supply the heat lost by the cooling surface.

EXAMPLE. How many square feet of direct radiation surface will be required to supply the heat lost through 35 square feet of loose window surface of a dwelling, when the temperature outside is zero, if the window is in the north side of a building in a town (building not isolated)?

Find the point on the left-hand scale corresponding to 35, a dotted line has been drawn so that the steps may be followed; then trace out to the line marked "0 degrees;" then trace upward to the line marked "Loose Window;" then trace towards the right to the line marked "N. or W. Exposure, Building not Isolated;" then trace downward to the line marked "Direct Radiation, Heating Continuous;" then trace toward the right to the scale marked "Square Feet of Heating Surface," and find that it takes 22 square feet of direct radiation surface.

In order to find the total amount of heating surface necessary to keep a room warm, find the number of square feet of heating surface necessary for each window and for the different walls; and the sum of all these quantities will be the total square feet of heating surface required for the room.

To find the total amount of heating surface required for a building, add the amounts required for the different rooms.

In using the chart it must be rembered that:—

1. The temperature inside of the building is supposed to be kept at 70 degrees.

2. A "1 Brick Wall" means a wall 1 brick thick; a "2 Brick Wall" means a wall 2 bricks thick; etc., etc.

3. By "Building not Isolated" is meant a building somewhat protected from high winds by other buildings; and by "Building Isolated" is meant a building in the country, or in a very sparsely built up town, that is exposed to high winds.

4. By "Heating Continuous" is meant heating such as is usual in steam heated dwellings; and by "Heating not Continuous" is meant heating such as is usual in churches, meeting-halls, and other buildings that are allowed to become cold between times of use.

5. By the exposure of a wall or window is meant the direction which it faces. Thus, a window is said to have a north exposure when it faces the north.

6. When a wall with a north or west exposure is protected by a building within a few feet of it, it must be considered as having a south or east exposure.

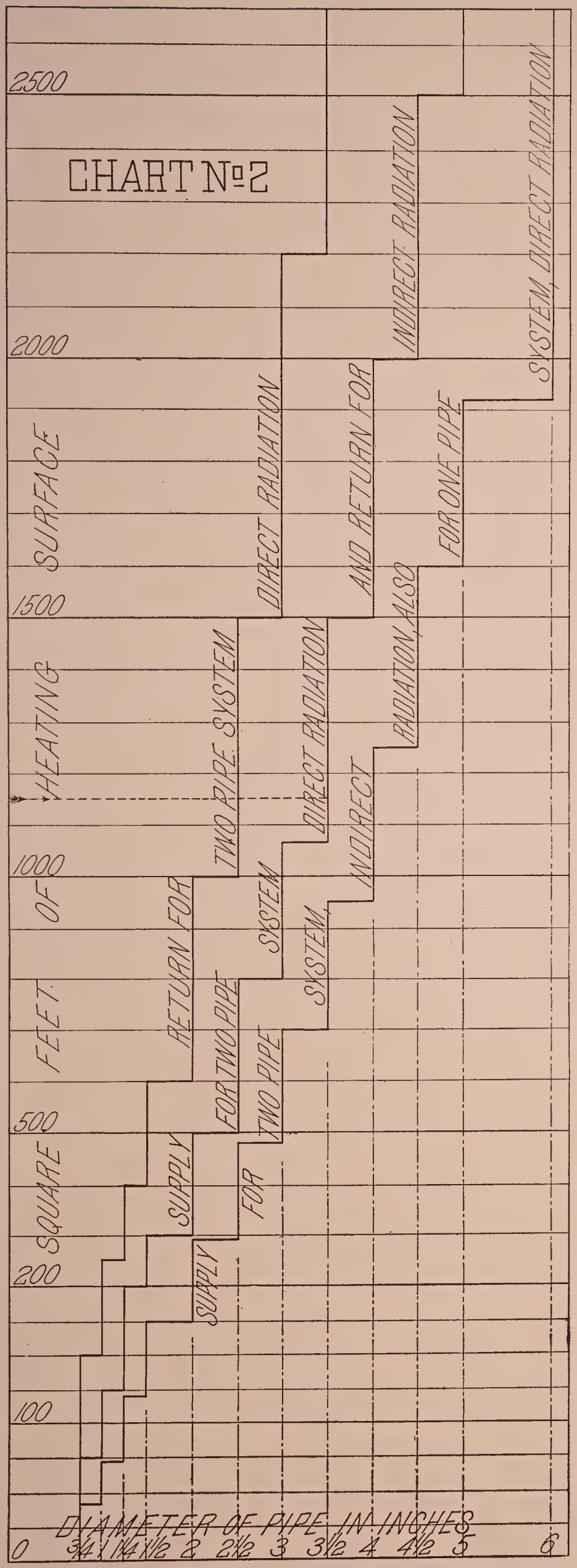
7. It is necessary to find the number of square feet of heating surface required for *each window by itself*, as the cooling effect of two windows each having the same number of square feet of glass surface, is greater than the cooling effect of one window having twice that number of square feet of glass surface.

8. When an ordinarily tight window is protected from winds by the wall or walls of a building within a few, 4 or 5, feet of it, it may be considered as "Tight Glass."

9. When it is necessary to find the heating surface required for more than 300 square feet of wall or tight glass surface, imagine the wall to be divided into a number of equal parts and find the heating surface required for one of these parts; then multiply this by the number of the parts into which it was supposed the wall surface was divided. Thus, to find the number of square feet of heating surface required for 1,000 square feet of wall surface, find the heating surface required for 250 square feet of the wall surface and multiply this amount by 4.

FRAME BUILDINGS.

It is almost impossible to give any general rules in



regard to frame buildings, on account of the very great difference in their construction. It is probably safe, however, to assume that the cooling effect of the wall of a well built frame house, sheathed with tongued and grooved sheathing and paper covered, is but little greater than that of a two-brick wall; and it is probably safe to assume that the cooling effect of the wall of a fairly well built frame house is about the same as that of a one-brick wall.

CHART NO. 2.

This chart is for determining the diameters of the supply and return pipes for a heating system. The scale on the left-hand border is for the number of square feet of heating surface in the direct radiation radiators or the indirect radiation heaters, and the scale at the bottom of the chart is for the diameters of the pipes in inches.

To use the chart, find on the vertical scale the point corresponding to the number of square feet of heating surface to be supplied with steam, and trace out along an imaginary horizontal line to the line indicating the kind of heating surface in the system, direct or indirect, and the kind of pipe, return or supply; then trace down to the bottom scale and find the diameter of the pipe.

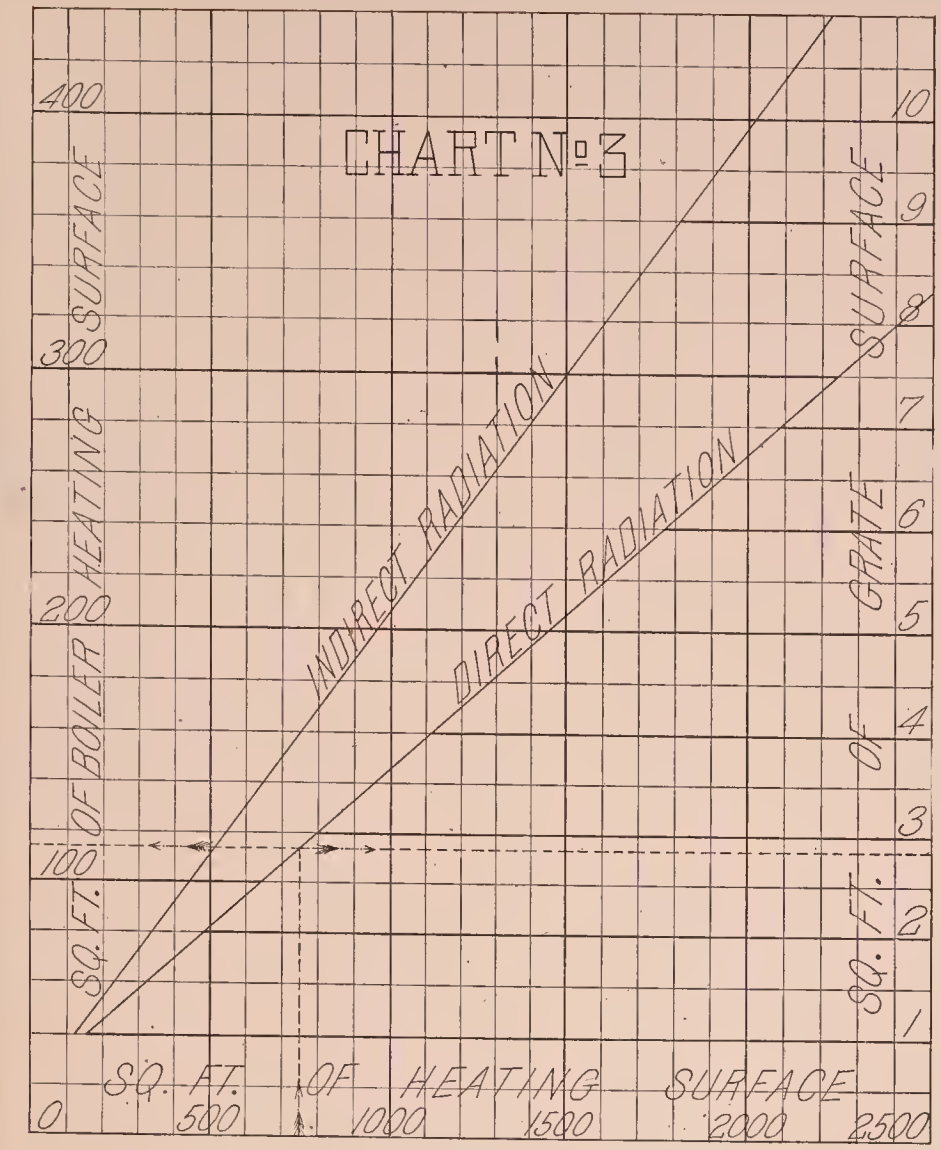
Example. What must be the diameters of the supply and return pipes for 1,150 square feet of direct radiation surface?

Find the point on the vertical scale corresponding to 1,150 square feet of heating surface, and trace towards the right, a dotted line has been drawn to illustrate the use of the diagram, to the line marked "Return for Two Pipe System, Direct Radiation;" then trace down to the bottom scale and find that the return pipe must be $2\frac{1}{2}$ inches in diameter. To find the diameter of the supply pipe, trace out from the point representing 1,150 square feet of heating surface to the line marked "Supply for Two Pipe System, Direct Radiation;" then trace down to the bottom scale and find that the diameter of the supply pipe must be $3\frac{1}{2}$ inches.

Horizontal pipes must always be laid with a fall of from 1 inch in 10 feet to 1 inch in 20 feet in the direction in which the pipes drain. The fall should not be less than 1 inch in 20 feet, and there is no necessity for it to be greater than 1 inch in 10 feet.

CHART NO. 3.

This chart is for finding the number of square feet of boiler heating surface and the number of square feet of grate surface for a boiler that is to supply steam to a steam heating system. The scale at the bottom of the chart is for the square feet of radiator heating surface, direct or indirect, that is to be supplied with steam; the scale on the left-hand border is for the square feet of boiler heating surface; and the scale on the right-hand border is for the square feet of grate surface. To use the chart, find the point on the bottom scale that corresponds to the number of square feet of heating surface, direct or indirect, that is to be supplied with steam, and trace upward along an imaginary vertical line to the line indicating the kind of radiation surface in the system; then trace to the scale on the left-hand border and find the number of square feet of boiler heating surface required. On the right-hand scale, opposite the number of square feet of boiler heating



surface, will be found the number of square feet of grate surface that is required.

Example. How many square feet of boiler heating surface and grate surface will be required for 750 square feet of direct radiation surface?

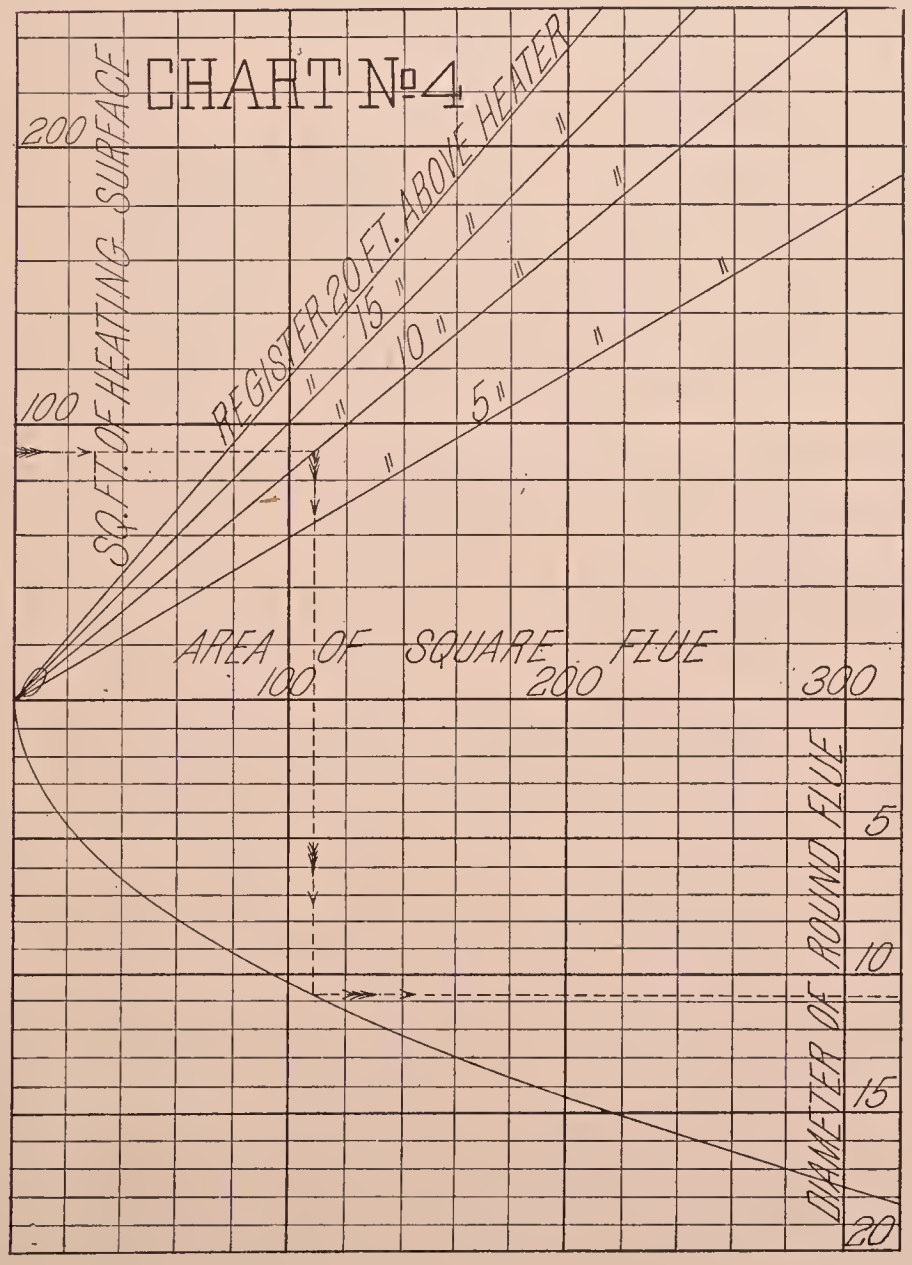
Find the point on the bottom scale corresponding to 750 square feet of heating surface, and trace upward, a dotted line has been drawn to illustrate the use of the chart, to the line marked "Direct Radiation;" then trace to the scale on the left-hand border and find that about 115 square feet of boiler heating surface will be required. Trace across the diagram, from the point indicating 115 square feet of boiler heating surface, to the scale on the right-hand border and find that about 2.8 square feet of grate surface will be required.

If the system contains some indirect heating surface and some direct heating surface, find the boiler heating surface and the grate surface required for the indirect heating surface and for the direct heating surface; then add the boiler heating surface required for the indirect heating surface to that required for the direct heating surface, and the sum is the total boiler heating surface required for the system. Also, add the grate surface required for the indirect heating surface to that required for the direct heating surface, and the sum is the total grate surface required for the system.

CHART NO. 4.

This chart is for determining the area of the cross-section of a square flue, or the diameter of a round flue, leading from an indirect radiation heater to the register in a room to be heated. The scale on the upper part of the left-hand border is for the square feet of indirect heating surface in the indirect heater; the horizontal scale is for the area of the cross-section of the square flue in square inches; and the scale on the lower part of the right-hand border is for the diameter of the round flue.

To use the chart, find the point on the scale on the left-hand border corresponding to the number of square feet of surface in the indirect heater, and trace out to the line indicating the distance the center of the register will be above the center of the heater; then trace downward to the horizontal scale and find the area of the flue in square inches, if the flue is to have a rectangular cross-section; but if the flue is to be round, trace down to the curved line in the lower part of the chart, and then trace to the scale on the right-hand border to find the diameter.



Example. What must be the area of the cross-section of a rectangular flue, and the diameter of a round flue, for 90 square feet of indirect heating surface, if the center of the register is to be 10 feet above the indirect heater?

Find the point on the left-hand scale correspondponding to 90, and trace outward to the line marked "Register 10 Feet Above Heater;" then trace downward to the horizontal scale and find the cross-section of the square flue to be about 109 square inches. To find the diameter of the round flue, trace down past the horizontal scale to the curved line in the lower part of the chart; then trace to the right-hand scale and find the diameter of the flue to be about 11 inches.

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CHARTS

FOR

LOW PRESSURE STEAM HEATING,

FOR THE USE OF

Engineers, Architects, Contractors, and Steam Fitters.

BY

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Member American Society of Heating and Ventilating Engineers; Etc., Etc.

NEW YORK:
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